interest, but even the known texts gain from the enriched contexts in which they are set. In an age such as ours, where mathematics and logic often degenerate into mere exercises and philosophy is so attracted to banalities such as private worlds and nothingness, the voice of a real thinker is all the more desirable.

**Studies in the Exact Sciences in Medieval Islam.** By Ali A. Al-Daffa and John S. Stroyls. Dhahran (University of Petroleum and Minerals); New York (John Wiley & Sons). 1984. $39.95.

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The history of the exact sciences in medieval Islam is an exciting field for research. Primary sources are legion, and the bibliographical works of Suter, Brockelmann, and Sezgin serve as reliable guides; the secondary sources (mainly in German, French, Spanish, English, and Russian) reflect the sophistication and diversity of the achievements of the Muslim scientists. Most scholars in the field are involved in studying and editing original sources (*Quellen*), then translating or analyzing them (*Studien*).

The authors of the volume under review are on the faculty of the College of Sciences at the University of Petroleum and Minerals, Dhahran, Kingdom of Saudi Arabia, and perhaps it should be stated that the second author is a personal friend of this reviewer. The authors' approach to the history of Islamic science differs from that described above: essentially they attempt to gain new insights into the subject without consulting the primary sources for themselves. The inordinate number of errors in the transcription of Arabic personal names, titles, and technical terms indicates that the authors are simply not well versed in medieval Arabic and explains why they have generally preferred not to go back to the original sources. One detects throughout the book the hand of a competent mathematician and notes a meticulous citation of sources, but, this notwithstanding, the volume is a major disappointment.

Perhaps what disturbs me most about this volume is the pretentiousness of its title, which would be more appropriate for a volume in the *Quellen und Studien* tradition. The reader interested in serious research on Islamic science should consult the recently published volume of reprints of some seventy-five *Studien* by E. S. Kennedy, his colleagues, and students, bearing a title remarkably similar to that of the work under review [Kennedy 1983]. Most of Kennedy's studies are of the following format: (1) identification of some new source material or of some published material deemed worthy of investigation, (2) presentation of text or translation or summary, and (3) commentary. Those of Kennedy's papers which are not of this format are surveys based upon such studies. This is not an elitist approach: the consensus of scholars in this field for the past 150 years has been

that this is the optimum means of handling the vast amount of available material. Unfortunately no reliable survey of the field exists yet, and attempts to write such works by those unfamiliar with the primary or secondary sources have proved disastrous [1].

The authors of this volume have collected a series of "studies" presented by them at various international conferences over the past ten years. The titles of the individual essays are as follows:

1. Transmission of science and technology between East and West during the period of the Crusades;
2. Pythagorean theorems and mumpsimus;
3. Some myths about logarithms in Near Eastern mathematics;
4. Naṣīr al-Dīn al-Ṭūsī's attempt to prove the Parallel Postulate of Euclid;
5. Ibn Sīnā as a mathematician;
6. Numerical analysis in the Middle East (9th–15th centuries); and
7. The geometric theory of equations in the Near East in the Middle Ages.

I shall restrict comment to just four of these: (1), (3), (4), and (5). My colleague Dr. Jan P. Hogendijk has discussed (7) in a review for the *British Journal for the Philosophy of Science* (1985).

(1) The authors have tried to write about the transmission of science during the Crusades (at both ends of the Mediterranean) without having made a study of the state of science and technology in Ayyubid Syria or contemporary Andalusia. They have not consulted scholars working on Ayyubid astronomy and technology. Likewise there are numerous studies on aspects of Andalusian science which have appeared in the past decade: none of these has been consulted. Of course the theses of Haskins need to be revised, but this should be done only by scholars who know the secondary literature, or even better, the primary sources. The authors of this revision *do not even mention* the role of the Jews in the transmission of science to Europe.

(3) The chapter on "logarithms" in Islamic mathematics attempts to demolish some prevailing myths. Certain scholars in the 19th century wrote that Muslim astronomers were familiar with the prosthaphaeresis formulas of trigonometry; this assertion is now recorded in S. H. Nasr's *Islamic Science* and even in the *Encyclopaedia of Islam* (article "Ibn Yūnus") and F. Sezgin's *Geschichte des arabischen Schrifttums* (Vol. 5 on mathematics). Yet in a recent publication [King 1973] I pointed out that the assertion is fallacious. A useful contribution would have been a presentation of the few relevant texts, a translation, and an indication of how they were misinterpreted by earlier historians of science. In short, it would have been more appropriate to kill the myth once and for all. Yet the authors chose not to consult the original texts of Ibn Yūnus or of the mysterious Ibn Hamza, whose name has been associated with the use of logarithms (all of the relevant texts are unpublished but are readily available on photographs or microfilms). Instead they preferred to quote *verbatim* from earlier modern writers and

to speculate on the significance of the interpretation of their predecessors: thus their "study" adds nothing of consequence to the literature.

(4) From the chapter on al-Ṭūsī's "proof" of the Parallel Postulate, we learn that the method in the Rome edition of the redaction of the *Elements*, usually attributed to al-Ṭūsī (which has been studied by Suter, Heath, and others), is not by al-Ṭūsī: a reference shows that B. A. Rosenfeld in Moscow has established this, and further information would have been welcome. Our author's account of prior attempts by Muslim scholars is based on information in the survey articles in the *Dictionary of Scientific Biography*, not on the most recent secondary literature. The survey of the methods of pseudo-al-Ṭūsī is based on Heath along with Rosenfeld and Youshkevitch. But the Arabic text of an entire treatise on this subject by al-Ṭūsī has already been published. Why not consult it? Or better, why not study it, translate it into English, and annotate it? B. A. Rosenfeld and also K. Jaouiche have in press independent studies (in Russian and French, respectively) of all available Arabic texts on the Parallel Postulate, but there is not much of consequence on this subject in English, except for various articles by A. I. Sabra (which the authors did not consult).

(5) The essay which inspires the highest expectations is the one on medieval numerical analysis. But it fails to exploit most of the available secondary literature. Surely Ḥabash's use of the so-called Kepler equation is worth more than one line? Is not al-Kāshī's use of limiting sequences to determine the sine of 1° to the equivalent of twelve decimal places worth more than a passing remark? The authors do not cite A. Aaboe's investigation of this method, which is listed in the bibliography for the next essay (where al-Kāshī's method is mentioned again but without reference to Aaboe!). Youschkevitch's survey of Islamic mathematics [1976] is deficient in that it is restricted mainly to texts on *mathematics per se*; as E. S. Kennedy's work over the past thirty years has shown, the history of numerical analysis in the Near East also has to be based on methods in *astronomical* texts. Yet apart from a few articles by Suter, Luckey, and Kennedy, the sources for this essay, too, appear to be articles on mathematics in the *DSB*. (J. L. Berggren is now writing an overview of the subject based on the secondary material currently available, and G. Saliba and R. Rashed are gathering all of the primary material for a more thorough investigation than has been conducted hitherto.)

The book contains enough mathematical formulas, carefully documented quotes from scholars such as Neugebauer, Kennedy, Rosenfeld, and Rashed, as well as bibliographical information, to impress an unsuspecting reader. However, little of its contents will be taken seriously by historians of science. *Studien* not based on *Quellen* are simply not worthy of the name. For the reader who wants an overview of Islamic mathematics or a brief and reliable (if outdated) account of Muslim treatment of specific topics, the work of Youschkevitch [1976] (available in Russian, German, and French, though unfortunately not in English) remains unchallenged. A useful overview of more recent advances in this subject has just been published by J. L. Berggren [1985].

## NOTE

1. S. H. Nasr, *Islamic Science: An Illustrated Study* (London: World of Islam Festival Publishing Company, 1976), is of value mainly for the plates; see my review of the sections on the exact sciences in *Journal for the History of Astronomy* **9**, 212–219 (1978). Daffa's book, *The Muslim Contribution to Mathematics* (London: Croom Helm; Atlantic Highlands, N. J.: Humanities Press, 1977), is assessed in *History of Science* **17**, 295–296 (1979). Both of these reviews are reprinted in King [1986].

## REFERENCES

Berggren, J. L. 1985. History of mathematics in the Islamic world: The present state of the art. *Bulletin of the Middle East Studies Association of North America* **19**, 9–33.

Kennedy, E. S., *et al.* 1983. *Studies in the Islamic exact sciences*. Beirut: American University of Beirut Press.

King, D. A. 1973. Ibn Yūnus' very useful tables for reckoning time by the sun. *Archive for History of Exact Sciences* **10**, 342–394. Reprinted in King [1986].

——— 1986. *Islamic mathematical astronomy*. London: Variorum Reprints.

Youschkevitch, A. P. 1976. *Les mathématiques arabes (VIIIe-XVe siècles)*, M. Cazenave and K. Jaouiche, trans. Paris: J. Vrin.

**Matematiki i Astronomi Musulmanskogo Srednevekovya i Ikh Trudy (VIII–XVII vv.)** [Mathematicians and Astronomers of the Islamic Middle Ages (VIII–XVII Centuries) and Their Works]. By G. P. Matvievskaya and B. A. Rosenfeld. Moscow (Nauka). 1983. 3 vols., 479 + 650 + 372 pp.

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As suggested by its title, this publication is intended to update and expand on H. Suter's *Die Mathematiker und Astronomen der Araber und ihre Werke*, first published in 1900 and reprinted in 1982 [see my review in *Journal of the History of Astronomy* **14**, no. 1 (1983), 62–63]. Suter's book was a biobibliographical survey of Muslim scholars in the exact sciences, arranged chronologically by author and based on all currently available manuscript catalogs and medieval biographical dictionaries. More information of the same kind has been contributed since 1900 by C. Brockelmann, M. Krause, H. P. J. Renaud, C. A. Storey, and F. Sezgin. The volumes on the sciences in the monumental *Geschichte des arabischen Schrifttums* of Professor Sezgin of Frankfurt replace the work of Suter for the period up to 1050, but for the later period interested scholars must use all of these other works.

Professor Matvievskaya of the Institute for the History of Mathematics in Tashkent and Professor Rosenfeld of the Institute for the History of Science and Technology in Moscow have undertaken the formidable task of gathering and rearranging all the material in these earlier works. Much of this publication consists of Arabic personal names and titles in Cyrillic transcription as well as lists of manuscripts and bibliographical citations. The authors have produced a work which all their colleagues in the field will welcome as a standard reference tool.